Mapping the Road to Connected Transportation

October 19, 2016  |  GENIVI All-Members Meeting

Hubert Belser
VP Strategy and Technology Office, Wind River
<table>
<thead>
<tr>
<th>Category</th>
<th>Traffic per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG INTERNET USER</td>
<td>~1.5 GB</td>
</tr>
<tr>
<td>SMART HOSPITAL</td>
<td>3,000 GB</td>
</tr>
<tr>
<td>AUTONOMOUS AUTOMOBILE</td>
<td>4,000 GB</td>
</tr>
<tr>
<td>AIRPLANE DATA</td>
<td>40,000 GB</td>
</tr>
<tr>
<td>SMART FACTORY</td>
<td>1,000,000 GB</td>
</tr>
</tbody>
</table>
1900: Where is THE CAR?

5th Ave New York City, April 15, 1900

5th AVE NYC

1913

Where is the horse?
Benefits of autonomous cars:

- Zero accidents
- Mobility for all
- Environmental sustainability
- Reduced congestion
- Increased productivity
- Appropriate regulations

Autonomous cars total savings: $1.3 trillion

- Total savings from accident avoidance: $488 billion
- Increased productivity from autonomous cars: $507 billion
- Increased productivity from congestion avoidance: $138 billion
- Fuel savings from avoiding congestion: $11 billion
- Fuel savings: $158 billion

Source: Predictions for U.S. market, Morgan Stanley research, 2014
Regulations: Friend or Foe?

- Standardize on signs and signals
- Speed limits - and speeding tickets may disappear
- Some old tech remains useful
- Regulation spurring Innovation?

Uber’s First Self-Driving Fleet Arrives in Pittsburgh This Month

The autonomous cars, launching this summer, are custom Volvo XC90s, supervised by humans in the driver's seat.
Safer and happier Cities

Same experience everywhere

More free time

New connected experiences

Reduced car ownership

Increase in outdoor activities

Increased productivity

Reduced congestion

Appropriate regulations

Increased outdoor activities

Same experience everywhere
The World is increasingly Activities and Experience driven
## SERVICE MENU

<table>
<thead>
<tr>
<th>Service</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>New In-Vehicle Experiences</td>
<td>$/month</td>
</tr>
<tr>
<td>Optimize your day with data</td>
<td>$/month</td>
</tr>
<tr>
<td>Take your profile with you</td>
<td>$/month</td>
</tr>
<tr>
<td>New productivity Apps</td>
<td>Freemium</td>
</tr>
<tr>
<td>Integrated commuting</td>
<td>$/month</td>
</tr>
<tr>
<td>Fleet management</td>
<td>$/month</td>
</tr>
<tr>
<td>Smart City integration</td>
<td>Gold/Silver packages</td>
</tr>
<tr>
<td>Google rides</td>
<td>Free, loyalty programs</td>
</tr>
</tbody>
</table>
Essential is to get from A to B

“Get anywhere” mobility package for 300 €/month:

- Transportation from A to B according to a service-level agreement (e.g. pickup in 7 minutes)
- Including all transportation (regional public transport, taxi, car and ride sharing, bike sharing etc.)
- Including transport related services (city logistics, home deliveries etc.)
- Roaming in other cities and countries
BENEFITS

Expectations

business plan

marketing

goals

market

opportunity

idea

plan

competition

Copyright © GENIVI Alliance 2016 | October 19, 2016 | 13
The Winning Recipe

1. Security and Reliability: Getting data into and out of the vehicle securely and timely

SECURITY
- E2E security starts with a HW root-of-trust
- No safety without security
- SW lifecycle management
- RVI for provisioning, authentication, authorization
- System wide Identity

RELIABILITY
- Predictable round-trip latency, QoS metrics
- Deterministic networking (TSN)
- 4G → 5G is vital
- Silicon & software footprint in the network will increase
The Winning Recipe

2. Smart Infrastructure: Critical backend systems with guaranteed QoS

CLOUD NATIVE ARCHITECTURE
- On-prem vs public cloud
- How many 9’s do you need?
  - Multi Tenancy
  - On-demand Usage
  - Ubiquitous Access
  - Elasticity
  - Resilience
- Measured Usage

SOFTWARE DEFINED
- Virtualization
- Software defined networking
- Latency, availability and predictability become critical
- Enabling IT like cost-structures with OT-like QoS

OPex instead of CAPex
The Winning Recipe

3. Data → Insights → Actions

IN-VEHICLE
- Operational data driving autonomous actions
- Data normalization, computer vision, sensor fusion
- Run machine learning models
  Tracking and monitoring system

BUSINESS LOGIC
- Dashboards
- Trends and Patterns
- Fleet management
- Predictive maintenance
- Billing and payment systems
- Customer intimacy
- Application Platforms
  “Service Integration Platforms”

linking cars with smart cities
The Winning Recipe

4. Autonomy: Traditional cloud moving closer to the vehicle

FOG
- More in-vehicle compute and storage
- Local analytics and decision making: ML/DL training in the cloud, push models to the car

Cloud evolution: gross scale data analytics, cross-domain data

ORCHESTRATION
- Dynamic and intelligent workload placement
- Workflow automation
- System monitoring
- Dynamically adapt to traffic flow and accidents
Cities and AV operators will demand highly reliable backend systems to meet SLAs.

Data becomes the currency of the connected world.

Software-defined infrastructure will emerge.

Requiring both local and cloud compute and storage.

Local analytics and decision making become critical.

Getting data into and out of the vehicle timely and securely.

Requiring us to rethink Connectivity and Networking Architecture.
Thank you!

Visit GENIVI at http://www.genivi.org or http://projects.genivi.org

Contact us: help@genivi.org